



NAVAL AVIATION VISION
2020

SEA WARRIOR AIRCRAFT ROADMAP

The mission of the Chief of Naval Air Training (CNATRA) is on-time delivery of fully qualified Naval Aviators and Naval Flight Officers (NFOs), trained using leading-edge technology. This is the foundation upon which all of Naval Aviation's achievements rest in support of Sea Power 21. CNATRA's inventory includes basic propeller, helicopter, multi-engine, and advanced jet trainers.

T-6A *Texan* Joint Primary Training System

The first aircraft flown by aspiring Navy and Marine Corps pilots are the T-34C *TurboMentor* and the T-6A *Texan II*. The T-34C has served as the primary training platform for the past 25 years and by 2015 will be completely retired from the inventory. CNATRA is currently transitioning to the T-6A *Texan II*, a giant leap forward in primary training with a digital cockpit, ejection seats, cockpit pressurization, and significantly improved flight performance. A future variant, the T-6B, with an all-glass cockpit and Synthetic Radar Training (SRT) capability, is planned for the improved Joint NFO/Combat Systems Officer (CSO) training curriculum.

T-45 *Goshawk* Undergraduate Jet Pilot Training System

CNATRA has completely transitioned advanced jet training to the T-45 *Goshawk*. Although the T-45 inventory is currently a mix of analog and digital aircraft, the Required Avionics Modernization Program (RAMP) will soon digitize all T-45 cockpits to more adequately prepare students for tomorrow's advanced tactical jet aircraft. With RAMP, the T-45 *Goshawk* will last well into the 21st century. The T-2C *Buckeye* is currently used only for NFO training and will soon be completely retired from service.

T-39G/N *Sabreliner*

The T-39G/N *Sabreliner* is a radar intercept training platform for NFOs. When the Sabreliner reaches the end of its service life, CNATRA will use a future variant of the T-6 with an all-glass cockpit and SRT capability in concert with advanced simulation. The T-45 *Goshawk*, which will be used for Advanced Tactical Maneuvering training, will be used along with this T-6 variant to meet the training requirements of the 21st century strike fighter NFO.



T-44A *Pegasus* and TC-12B *Huron*

The T-44A *Pegasus* and the TC-12B *Huron* are both twin-engine, pressurized, fixed-wing aircraft used for multi-engine aircraft intermediate and advanced training. Navy, Marine Corps, Air Force, and Coast Guard pilots start their training for Sea Basing and Sea Shield missions in the T-44A and TC-12B.

TODAY

TH-57B/C

2020

T-34C

T-6A

T-6A

T-44A

TC-12B

T-2C

T-6B

T-45A/C

T-45C

T-39G/N

TH-57B/C *Sea Ranger*

The TH-57B/C *Sea Ranger* remains as the Navy's sole, Primary Rotary Aircraft Training platform. Operating from Naval Air Station (NAS) Whiting Field, the TH-57B/C will continue its service for at least two more decades. Future upgrades to the TH-57 include a digital cockpit to enhance training and more closely match the capabilities of Navy and Marine Corps fleet helicopters.



WEAPONS ROADMAPS

The Navy possesses over a dozen types of strike weapons in the categories of precision guidance, defense suppression, free-fall, and air-to-air. They facilitate Naval Aviation's ability to conduct missions in support of Sea Strike and Sea Shield.

Precision weapons increase the number of aim points per sortie and minimize collateral damage. They deny enemy sanctuary by destroying a wide number of moving and hardened targets. Standoff weapons, released outside point air defense zones, silently glide to impact, minimizing launch platform vulnerability. New technologies beyond the year 2010 include Directed Energy Weapons (DEWs) and High Speed Weapons (HSWs).

The following roadmaps show current and future air-to-air and air-to-ground weapons. Naval Aviation will consolidate existing inventories to save investment funds, reduce training requirements, and improve the agility of carrier operations.



LONG-RANGE STANDOFF WEAPONS

AGM-84E Harpoon

Air-launched *Harpoon* is an all-weather, anti-ship cruise missile designed to destroy maritime targets. At ranges in excess of 67 nautical miles, the weapon employs a low-level cruise profile with inertial midcourse guidance and active radar terminal homing. The weapon weighs 1,523 pounds (with booster) and has a 500-pound blast fragmentation warhead. *Harpoon* is resistant to countermeasures and will remain in the inventory until the year 2015.

AGM-84H/K Standoff Land Attack Missile-Expanded Response (SLAM-ER)

SLAM-ER is a 1,488-pound weapon with a 534-pound warhead. It is a multi-mission weapon system designed primarily for surgical strikes against ships and high-value land targets. *SLAM-ER* provides a standoff strike capability in excess of 135 nautical miles, increasing the survivability of the delivery aircraft. It will destroy moving maritime and land targets, re-locatable land targets, and hardened/semi-hardened land targets. *SLAM-ER* precision guidance comes from GPS, an Inertial Navigation System (INS), and an Imagery InfraRed (IIR) seeker with a Man-In-The-Loop (MITL) system for terminal control. The Automatic Target Acquisition (ATA) feature reduces pilot workload by automatically acquiring the target and providing real-time targeting cues, guiding the weapon to impact.

R/UGM-109 Tomahawk Land Attack Missile (TLAM)

TLAM is an all-weather subsonic cruise missile that can be fired from surface and submarine platforms. It can carry a nuclear (Block II) or conventional (Block II/III) payload. Currently active in the Fleet are the conventional, land-attack, unitary, 1,000-pound-class warhead variant (*TLAM-C*) and the submunitions dispenser variant, with 166 combined-effects bomblets (*TLAM-D*). A small cross-section, terrain-following capability, and low heat emission make the *Tomahawk* highly survivable during deep-strike missions.

The Block III *TLAM* has an improved engine for extended range, an insensitive warhead (in the 1,000-pound class), time-of-arrival control, and GPS navigation, which significantly reduces mission planning time and increases terminal accuracy. *Tomahawk* Block IV (*TLAM-E*), also known as *Tactical Tomahawk*, has several enhancements including in-flight aimpoint re-targeting and mission adjustment, two-way satellite communications, onboard mission planning, the ability to loiter in a target area, and the ability to provide single-frame imagery of the target and battle damage indications. It costs 50 percent less than the Block III and has a 15-year recertification period (versus 8 years for the Block III). Formal Fleet introduction of *Tactical Tomahawk* occurred in September 2004.

TODAY

2020

HARPOON

SLAM-ER

SLAM-ER

TLAM BLK III/IV



MID-RANGE STANDOFF WEAPONS

AGM-88E Advanced Anti-Radiation Guided Missile (AARGM)

AARGM is an upgrade program to add multi-sensor and geo-specificity capabilities to the *AGM-88 High Speed Anti-Radiation Missile (HARM)*. This will enhance *HARM*'s Time Critical Strike and Precision Attack capabilities. The *AARGM* upgrade includes: 1) a receiver for net-centric connectivity with off-board targeting information; 2) an advanced Anti-Radiation Homing Receiver coupled with conformal antennae for greater sensitivity; 3) expanded targeting capabilities and larger field of view to aid pilot situational awareness; 4) precision GPS/INS to help establish missile impact and avoidance zones; 5) an Active Millimeter Wave terminal radar to increase lethality against modern Air Defense Units (such as SAM radars that stop emitting); and, 6) advanced waveforms to counter Anti-Radiation Missiles (ARMs). The addition of a WIA transmitter will improve the ability to cue BDA.

The weapon's software fuses multiple sensors and expands *HARM*'s capability to attack targets outside the typical electromagnetic spectrum. *AARGM* also enhances the Sea Strike capabilities of the F/A-18C-F and EA-18G aircraft by means of greater Enemy Order of Battle (EOB) Situational Awareness (SA) and Destruction of Enemy Air Defenses (DEAD). IOC for *AARGM* is FY 2009.

AGM-154 Joint Standoff Weapon (JSOW)

JSOW is a family of armaments that permit Naval aircraft to attack targets at increased standoff distances. The weapons use GPS and INS for precision guidance. All *JSOW* variants share a common body but can be configured for use against area targets or bunker penetration. One improvement under consideration is a seekerless unitary warhead that uses fused targeting data from airborne platforms to hit moving targets. Other improvements include real-time intelligence prior to launch and the transmission of a Weapons Impact Assessment (WIA) prior to detonation.



TODAY

2020

HARM BLK V

AARGM



JSOW A/C



DIRECT ATTACK (DA) WEAPONS

AGM-65 Maverick

Maverick is an air-to-surface tactical missile designed for CAS, interdiction, and defense suppression. It is effective against armored targets, air defense sites, ships, ground transportation nodes, and fuel storage facilities. *Maverick* uses infrared guidance and targeting and has two types of warheads: one with a contact fuse in the nose, and the other with a heavyweight warhead on a delayed fuse for target penetration prior to firing. The delayed fuse is very effective against large, hard targets. *Maverick* will remain in the inventory until the year 2015, or until the current supply (about 400) is exhausted.

GBU-10/12/16/24 Laser-Guided Bombs (LGB)

LGB is a Navy and Air Force joint effort, with the latter acting as the lead and executive service for procurement. *LGBs* include GBU-10, 12, and 16 that use MK-80/BLU series General Purpose (GP) bomb bodies, and GBU-24 that uses the BLU-109 bomb body incorporating state-of-the-art guidance and control features. GBU-12 is a 500-pound class weapon, GBU-16 is a 1,000-pound class weapon, and GBU-10 is a 2,000-pound class weapon. An *LGB* has a MK-80/BLU-series warhead fitted with a laser-guidance kit and Computer Control Group (CCG) mounted on the bomb nose. An electronic fuse housed in the aft section of the bomb body initiates the warhead. The seeker, housed in the CCG, senses laser energy and sends signals to the CCG canards to guide the weapon to the spot of reflected energy. Laser energy can be applied to the target by ground or airborne designators, or self-designated by laser-configured aircraft. *LGBs* will remain in the inventory until at least 2020.

GBU-31/32/38 Joint Direct Attack Munition (JDAM)

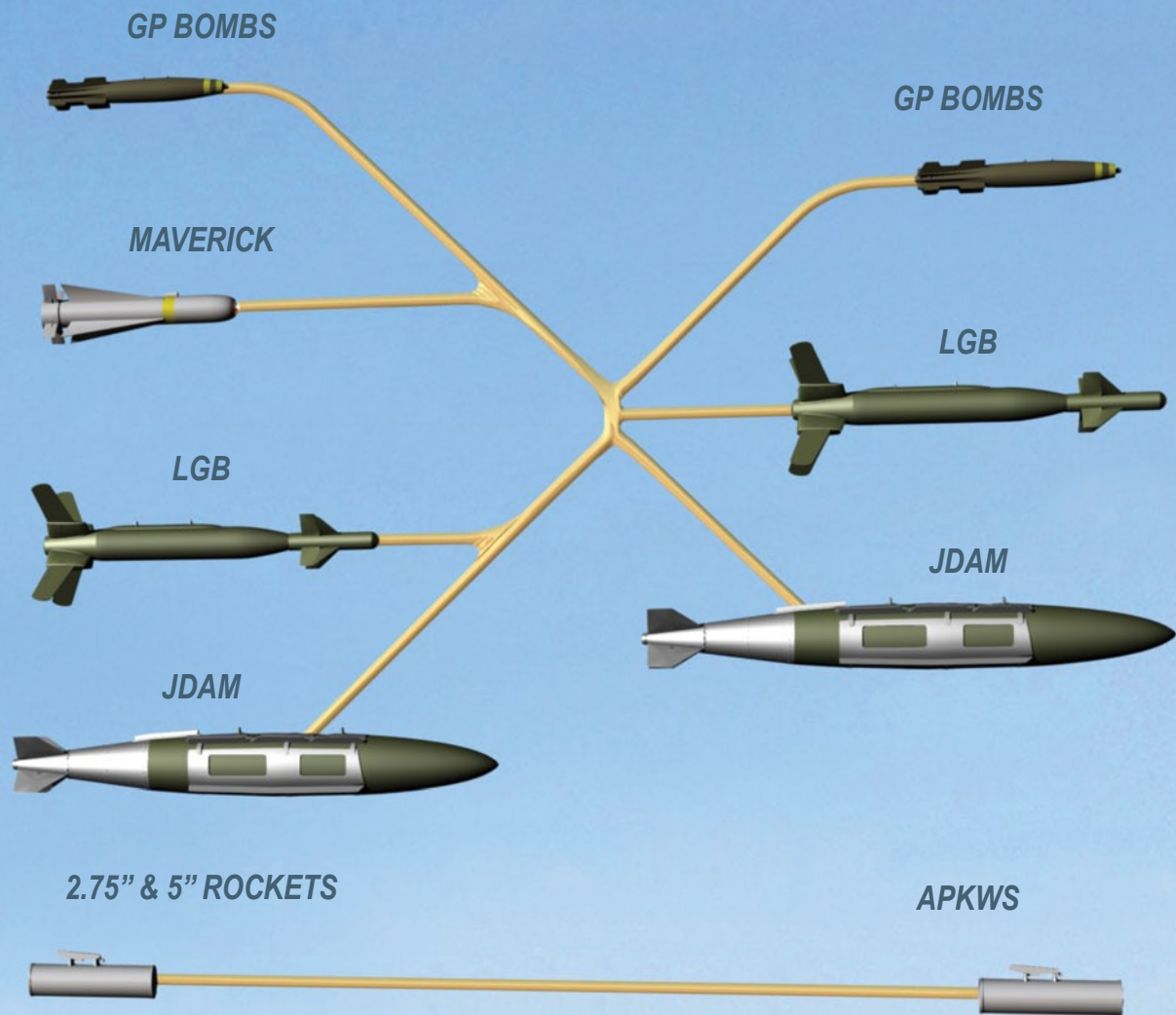
JDAM consists of GPS/INS guidance kits attached to GP bomb variants or the BLU-109 warhead. *JDAMs* address a wide number of fixed and re-locatable targets at ranges of 15 nautical miles from 40,000 feet. The weapon is autonomous, all-weather, and able to be re-targeted by the pilot prior to release. *JDAM* with GPS has an accuracy of less than 13 meters Circular Error Probable (CEP).

Advanced Precision Kill Weapon System (APKWS)

APKWS provides precision guidance to the existing 2.75 rocket system (scalable to 5.0 inch) for situations that do not require the use of a more expensive air-to-ground asset. It employs a semi-active laser and is accurate to within 2 meters of the aim point. The weapon will destroy target sets consisting of personnel, unarmored vehicles, lightly armored vehicles, APCs, structures, and MAN-Portable Air Defense Systems (MANPADS) at ranges from 1.5 to 5 kilometers. IOC for *APKWS* is FY 2008.

TODAY

2020



DIRECT ATTACK: MOVING/MOBILE TARGETS WEAPONS

Tube-Launched, Optically-Tracked, Wire-Guided Missile System (TOW)

TOW was designed to destroy enemy armored vehicles, non-armored vehicles, and crew-served weapons and launchers. It is an all-weather, command-to-line-of-sight, wire-guided weapon launched from the Marine Corps' AH-1W *Super Cobra* attack helicopter. *TOW* will remain in the inventory until the year 2015 or until the AH-1W helicopter is replaced by the AH-1Z. The latter will carry the *Hellfire* missile in place of *TOW*.

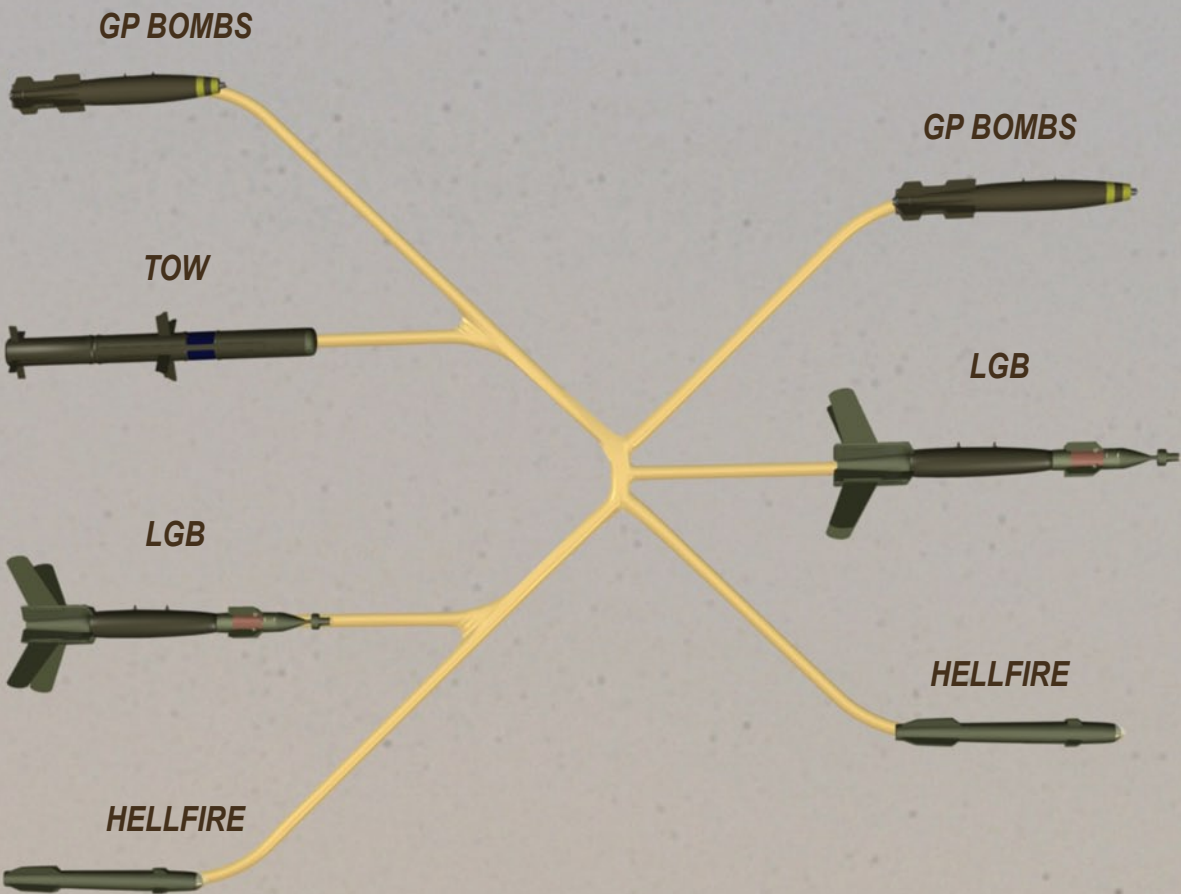
AGM-114 Hellfire

The *Hellfire* Air-to-Ground Missile System (AGMS) uses laser and radar frequency seekers to provide attack helicopters with a heavy anti-armor capability. The first generation *Laser Hellfire* is presently used as the main armament of the U.S. Marine Corps' AH-1W *Super Cobra* helicopter. *Laser Hellfire* homes on a laser spot projected by ground observers, other aircraft, or the launching aircraft itself, enabling autonomous, air or ground, direct or indirect, single-shot, rapid or ripple fire employment. *Hellfire* will remain in the inventory until the year 2020.



TODAY

2020



AIR-TO-AIR WEAPONS

AIM-9X Sidewinder

The AIM-9X *Sidewinder* is a major modification to the AIM-9M short-range, air-to-air missile. It will provide U.S. fighters with air superiority over tomorrow's advanced threats. The AIM-9X is upgraded with a focal-plane-array guidance-control section, a highly maneuverable airframe, and signal processors that enhance kinematics and infrared countermeasure capabilities. The Joint Helmet Mounted Cueing System (JHMCS) provides a "first look, first shoot" capability to Naval Aviators.

AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM)

AMRAAM is deployed on the F/A-18A+/C/D *Hornet* and the F/A-18E/F *Super Hornet* and will be deployed on the EA-18G and *Joint Strike Fighter* aircraft. Joint Navy and Air Force procurement of AMRAAM continues and deliveries of the AIM-120C are under way. The AIM-120C Pre-Planned Product Improvement (P³I) Program is a key factor in maintaining medium-range air superiority. This modernization plan includes clipped wings for internal carriage, a propulsion enhancement program, increased warhead lethality, and enhanced Electronic Counter-CounterMeasure (ECCM) capabilities through hardware and software upgrades. Ultimately, AMRAAM will be the Department of the Navy's sole Medium/Beyond Visual Range (M/BVR) missile.

The AIM-120C-7 configuration is a product of P³I Phase 3 and is scheduled to achieve IOC in FY 2006. Continued procurement of the Joint AMRAAM, with a P³I Phase 4 contract, will provide significant network-centric warfare capability, GPS, improved high-off-boresight capability, and missile kinematics. IOC for the Phase 4 AMRAAM is FY 2008.



TODAY

2020

AIM-9M



AIM-9X



AIM-7



AIM-120



AIM-9X P³I



AIM-120D P³I

